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(54) **PAPIER SPECIAL**

(54) **SPECIAL PAPER**

(57) Le point central de la présente invention consiste à appliquer un produit de couchage qui renferme des pigment organiques filmogènes (pigments plastiques) et des liants sur au moins un côté du papier ou du substrat du papier et à produire ensuite un film à partir de cette préparation après l'impression en appliquant au moins de la chaleur, mais de préférence en appliquant à la fois de la chaleur et de la pression. L'encre d'impression est noyée entre les pigments plastiques fondus ou frittés et ne peut donc plus être maculée. La surface du papier résiste désormais à l'abrasion et a des propriétés semblables à celles d'un film à cause du film plastique et possède au moins un joint hydrofuge et, si ce n'est un joint imperméable à l'eau. L'image de l'impression appliquée semble plus claire. Il a aussi été découvert que les images imprimées produites d'après cette invention ont une plus grande solidité à la lumière que les impressions ordinaires par jet d'encre.

(57) The core of the present invention consists of applying a coating that contains film-forming organic pigments (plastic pigments) and binders to at least one side of paper or a paper substrate and then producing a film from this after printing by applying at least heat, but preferably both heat and pressure. The printing ink is embedded between the fused or sintered plastic pigments and thus can no longer be smudged. The surface of the paper becomes abrasion resistant and has film-like properties due to the plastic film and has at least a water-repellent seal, if not a waterproof seal. The applied print image appears to the observer to have greater brightness. It has also been found that print images produced according to this invention have much greater lightfastness than traditional inkjet printings.

ABSTRACT

The core of the present invention consists of applying a coating that contains film-forming organic pigments (plastic pigments) and binders to at least one side of paper or a paper substrate and then producing a film from this after printing by applying at least heat, but preferably both heat and pressure. The printing ink is embedded between the fused or sintered plastic pigments and thus can no longer be smudged. The surface of the paper becomes abrasion resistant and has film-like properties due to the plastic film and has at least a water-repellent seal, if not a waterproof seal. The applied print image appears to the observer to have greater brightness. It has also been found that print images produced according to this invention have much greater lightfastness than traditional inkjet printings.

DESCRIPTION

TITLE

Special Paper

TECHNICAL FIELD

The present invention concerns a printable and a printed special paper, a process for producing same, uses thereof and a device for producing the printed special paper.

STATE OF THE ART

Especially in the field of inkjet printing, special papers are used that are provided with a coating that contains inorganic pigments to increase brightness in particular. Some of the materials used for the coating are expensive, which has a not insignificant effect on the price of inkjet paper. Accordingly, an attempt is made to make the coating as thin as possible. Despite the coating, water-based inkjet printings have only a low hygrostability and resistance to smudging. Their lightfastness also leaves much to be desired.

To protect inkjet printings from moisture and smudging in particular, and to a certain extent also to increase brightness, such paper is often laminated with a film, for which purpose special laminators are available. Such applications are also found in the areas of security and identification, where a photograph, passport photo, etc. is often also laminated into the film. However, for a skilled forger, such lamination hardly presents an obstacle to forgery or counterfeiting.

DESCRIPTION OF THE INVENTION

The aim of the invention is to disclose how inkjet printings in particular can be made more abrasion-resistant, smudge-proof and waterproof, brighter, more lightfast and finally more resistant in the sense of increased security against forgery.

With regard to this aim, the object of the invention is a printable special paper according to Claim 1 and a process for producing such a paper according to Claim 4.

The object of the invention is also a printed special paper according to Claim 9 and a process for producing such a special paper according to Claim 11.

Claims 20-22 concern special applications of the special paper according to the invention.

Finally, the invention also concerns a printing device according to Claim 23.

The core of the present invention thus consists of applying a film-forming coating that contains organic pigments (plastic pigments) and binders to at least one side of paper or a paper substrate and then forming a film after printing by applying heat at least, but preferably both heat and pressure. The printing ink thus becomes embedded between the fused or sintered plastic pigments and thus can no longer be smudged. The paper surface becomes abrasion-resistant, develops film-like properties due to the plastic film and is provided with at least a water-repellent seal if not a waterproof seal. The applied print image appears to the observer to have greater brightness. It has also been found that print images produced according to the

invention have much greater lightfastness than traditional inkjet printings. Additional expensive lamination, such as that conventionally used with inkjet paper, is not needed and can be omitted.

Equipment needed for film coating essentially amounts to no more than a suitable heat source such as a hot air fan or a radiant heat lamp. It is preferable, however, for pressure to be applied at the same time, as mentioned previously. This can be accomplished very easily with a conventional commercial laminator that works in a continuous process with heatable rollers or roller pairs such as those conventionally used for the above-mentioned lamination of film to a paper substrate. Of course, other heatable presses, etc. may also be used. The device needed to form the film could also be integrated directly into a printer to advantage and then used automatically there as needed, following the actual printing operation.

Due to the fact that the printing ink is embedded in the plastic film thus formed, subsequent changes in the print image would hardly be possible without being obvious. Therefore, this invention is especially suitable for use in the security field, e.g., for producing identification cards, passports, official documents, etc.

Waterproofness and smudgeproofness, but especially high brightness, are typical properties of paper prints of photographic images. With this invention, paper prints of practically the same quality can be produced by anyone starting from electronically stored images, for example, with a standard color inkjet printer and a simple laminator. In comparison with photographic paper, the coated special paper according to this invention is much less expensive. Even the surface

properties of the images in the sense of "matt" or "glossy" can be controlled very easily and determined through selection of the surface which is in contact with the image surface under pressure during film coating. Thus, it is sufficient to run a matt or glossy film through a continuous laminator together with the image or printing to be film coated. For "matt" surfaces, films with a surface roughness between 0.01 µm and 5 µm are suitable, and for "glossy" surfaces, films with a surface roughness of less than 0.01 µm are suitable. After film coating, the film must of course separate well from the film-coated surface after filming. Therefore, polyester or polyamide films (such as GRILON 6, 10, 12) are suitable. Teflon or ceramic materials should also be suitable for rollers in continuous film coating equipment or pressure plates of flat presses with regard to good reseparability.

The coating of the special paper according to this invention preferably has the following composition:

- 20-90% organic pigments,
- 1-30% binder
- 0-20% inorganic pigments
- 0-1% surface-active wetting agents
- 0-5% UV stabilizers
- 0-3% hydrophobing agents/sizing
- 0-10% plasticizer.

The above amounts are given in weight percent (wt%) based on the dry weight of the coating on the finished paper.

Suitable organic pigments include, for example, styrenes, acrylates and combinations thereof with melting points in the range between 90°C and 180°C, in particular, however, between 110°C and 140°C, and suitable binders include starch, polyvinyl alcohol,

polyvinylpyrrolidone or a plastic dispersion containing acrylate, styrene or PVAC.

The inorganic pigments are optional, but they may be added to increase brightness. Silicic acids, aluminum hydroxides, kaolins or carbonates are suitable.

UV stabilizers are also optional, especially since print images produced according to the invention have already proven to be very lightfast.

The wetting or penetration behavior of the coating compound on or in the paper substrate can be controlled with the surface-active wetting agents and/or the hydrophobing agents or sizing agents, if this is necessary at all.

To achieve the desired effect, the coating should be applied with a dry weight of 5-15 g/m^2.

There are no particular requirements with regard to the type of paper substrate and its grammage. Normal woodpulp paper or cotton paper or combinations thereof with a typical grammage in the range between 80 g/m^2 and 300 g/m^2 are suitable. For paper prints of photographs, papers with a higher grammage in the upper portion of this range are preferred. For applications in the security field, the layout is the same, but in this case papers with additional security elements (such as watermarks, chemical security devices or inkings that contain iridescent pigments) in the weight range of 70-150 g/m^2 are preferred. For most applications, it should be advantageous for the coating to penetrate partially or even completely into the paper when applied and to actually impregnate the paper.

It is advantageous if the mixture for producing the coating is prepared in the form of a dispersion, preferably an aqueous dispersion. The mixture can be applied off-line to the dry, finished paper substrate or it may be applied in-line to the unfinished web of paper in the paper machine. At any rate, the subsequent drying should be performed at a temperature at which there is no formation of a film, preferably at a maximum temperature of 70°C.

The organic pigments are preferably selected or formulated so that film coating can be performed at a temperature in the range between 90°C and 180°C, in particular between 110°C and 140°C. These temperatures can be achieved well with traditional laminators. At lower temperatures, there would be the danger that film coating would occur prematurely, in particular during the process of drying the coating or the paper web or in conveyance or storage of the finished paper. At temperatures higher than those indicated, there would be the danger of the paper drying out too much, which could have a negative effect on the properties of the paper and its flatness.

As mentioned previously, pressure is preferably applied simultaneously with and in addition to heat for film coating. Pressure in the range between 0.5 and 5 bar in a static press or a corresponding linear pressure in a continuous laminator has proven adequate and favorable.

Use of the invention is not limited to printing with inkjet inks, although the advantages according to the invention are especially manifested here. Laser printings can also be film coated well.

EXAMPLES

Example 1
Coating

A mixture of 70 wt% plastic pigment DPP 722 E from Dow Europe S.A., CH-8810 Horgen (organic pigment), 22 wt% ROPAQUE OP-84 from Christ Chemie AG, CH-4147 Aesch (organic pigment), 4 wt% polyvinyl alcohol (binder) and 4 wt% EGRAN HP from Bearle, CH-4142 Münchenstein/Basel (hydrophobing agent) is prepared with water to yield a dispersion that can be applied as a coating. The water content in the dispersion is set at 70 wt%.

Plastic pigment DPP 722 E from Dow Europe S.A. is available as a suspension. The individual pigment grains are solid spheres. For film coating, a temperature in the range between 120°C and 140°C is necessary. ROPAQUE OP-84 is also a suspension. The individual pigment grains are hollow bodies. For film coating, a temperature in the range between 80°C and 110°C is necessary. The 3:1 mixture of the two components can form a film at a temperature in the range between 110°C and 120°C.

Example 2
Printable special paper for normal inkjet applications

In a coating machine, the coating according to Example 1 is applied uniformly to one side of a dry, finished web of cellulose paper with a grammage of 100 g/m^2 in a layer thickness of 10 g/m^2 (dry weight) and then dried at 70°C in a drying zone (optionally lengthened).

Example 3
Printable special paper for normal inkjet applications

Before the end of the drying stage in a paper machine, the coating according to Example 1 is applied uniformly in a layer thickness of 10 g/m^2 (dry weight) to one side of the web of paper with a subsequent grammage of 100 g/m^2, and the web thus coated is then dried at 70°C in a drying zone (optionally lengthened).

Example 4
Printed special paper

A sheet of printable special paper produced according to Example 2 or 3 is printed by means of an inkjet printer. After drying the printing ink, the sheet is run through a continuous laminator which is set at a temperature of 140°C to form a film on the coating.

Example 5
Security document/identification card

A sheet of a printable special paper produced according to Example 2 or 3 but with a grammage of 100 g/m^2 and coated on both sides with the coating according to Example 1 with 10 g/m^2 on each side is printed with an inkjet printer, whereby in addition to text and ornamentation, an image, such as a passport photo of a person which has first been converted to an electronic form by scanning or has been recorded directly with a digital camera, is also printed out. After drying the printing ink, the sheet is run through a continuous laminator that is set at a temperature of 140°C to form a film on the two-sided coating. It is also possible to authenticate the document before film coating by a signature applied by hand.

Example 6

Paper prints of photographs

A sheet of the printed special paper produced according to Example 2 or 3 but with a grammage of 200 g/m^2, coated on the front side with a coating of 14 g/m^2 according to Example 1 and coated on the back side with 3 g/m^2 stearate pigments is printed with an inkjet printer on its front side with a graphical image that has previously been converted to an electronic form by scanning or has been recorded directly in this form with a digital camera. After drying the printing ink, the sheet is passed through a continuous laminator set at a temperature of 140°C to produce the film coating.

CLAIMS

1. A printable special paper, characterized by a coating that contains film-forming organic pigments and binders and is applied to at least one side.

2. A special paper according to Claim 1, characterized in that the coating has the following composition:

- 20-90% organic pigments,
- 1-30% binders
- 0-20% inorganic pigments
- 0-1% surface-active wetting agents
- 0-5% UV stabilizers
- 0-3% hydrophobing agents/sizing
- 0-10% plasticizers,

where

- the organic pigments are preferably styrenes, acrylates or combinations thereof with melting points in the range between 90°C and 180°C, in particular, however, between 110°C and 140°C,
- the binders are preferably starch, polyvinyl alcohol, polyvinylpyrrolidone or a plastic dispersion containing acrylate, styrene or PVAC, and
- the inorganic pigments are preferably silicic acids, aluminum hydroxides, kaolins or carbonates.

3. A special paper according to one of Claims 1-2, characterized in that the coating is applied with a grammage of 5-15 g/m^2.

4. A process for producing a special paper according to one of Claims 1-3, characterized in that a paper substrate is coated or impregnated on at least one side with a mixture containing film-forming organic pigments and binders.

5. A process according to Claim 4, characterized in that the mixture is preferably an aqueous dispersion and has the following composition:

- 20-90% organic pigments,
- 1-30% binders
- 0-20% inorganic pigments
- 0-1% surface-active wetting agents
- 0-5% UV stabilizers
- 0-3% hydrophobing agents/sizing
- 0-10% plasticizers,

where

- the organic pigments used are preferably styrenes, acrylates or combinations thereof with melting points in the range between 90°C and 180°C, in particular, however, between 110°C and 140°C,
- the binders used are preferably starch, polyvinyl alcohol, polyvinylpyrrolidone or a plastic dispersion containing acrylate, styrene or PVAC, and
- the inorganic pigments used are preferably silicic acids, aluminum hydroxides, kaolins or carbonates.

6. A process according to one of Claims 4-5, characterized in that the mixture is applied with a grammage of 5-15 g/m^2.

7. A process according to one of Claims 4-6, characterized in that the mixture is applied to the dry paper substrate off-line, preferably by coating, and the subsequent drying is performed at a temperature at *which film forming* does not occur, preferably at a maximum temperature of 70°C.

8. A process according to one of Claims 4-7, characterized in that the mixture is applied to the unfinished paper substrate in-line in the paper machine, preferably by coating, and the substrate

treated in this way is subsequently dried at a temperature at which film forming does not occur, preferably at a maximum temperature of 70°C.

9. A printed special paper, characterized in that it has a layer on at least one side in which printing ink is embedded in film-coated or sintered organic pigments and binder.

10. A printed special paper according to Claim 9, characterized in that, apart from the printing ink and paper fibers, the layer has the following composition:

- 20-90% organic pigments,
- 1-30% binders
- 0-20% inorganic pigments
- 0-1% surface-active wetting agents
- 0-5% UV stabilizers
- 0-3% hydrophobing agents/sizing
- 0-10% plasticizers,

where:

- the organic pigments used are preferably styrenes, acrylates or combinations thereof with melting points in the range between 90°C and 180°C, in particular, however, between 110°C and 140°C,
- the binders used are preferably starch, polyvinyl alcohol, polyvinylpyrrolidone or a plastic dispersion containing acrylate, styrene or PVAC, and
- the inorganic pigments used are preferably silicic acids, aluminum hydroxides, kaolins or carbonates.

11. A process for producing a printed special paper which has a layer on at least one side in which printing ink is embedded in film-coated or sintered organic pigments and binders, characterized by the following steps:

- printing a special paper which has a coating

that is applied to at least one side and contains film-forming organic pigments and binders, where the printing is applied to the coated side of the paper,

- producing a film coating on the coating by applying heat.

12. A process according to Claim 11, characterized in that the film coating is performed at a temperature in the range between 90°C and 180°C, in particular, however, between 110°C and 140°C.

13. A process according to one of Claims 11-12, characterized in that pressure, preferably a pressure between 0.5 and 5 bar, is applied simultaneously with film coating.

14. A process according to one of Claims 11-13, characterized in that the film coating is performed in a continuous process, in particular by passing it through heated rollers.

15. A process according to one of Claims 11-14, characterized in that the film coating is performed in a stationary heatable press.

16. A process according to one of Claims 11-15, characterized in that the film coating is performed in the printing machine immediately after printing or in a film coating unit connected to the printer.

17. A process according to one of Claims 11-16, characterized in that the film coating is performed with said layer in contact with a surface having a maximum roughness of 0.01 µm.

18. A process according to one of Claims 11-17, characterized in that the film coating is performed

with said layer in contact with a surface having a roughness in the range between 0.01 μm and 5 μm.

19. A process according to one of Claims 11-18, characterized in that the printing is performed by the inkjet method.

20. The use of the process according to one of Claims 11-19 to produce a printing with an abrasion-proof and/or water-resistant surface.

21. The use of the process according to one of Claims 11-19 to produce an identification or security document, an official document, etc.

22. The use of the process according to one of Claims 11-19 to produce paper prints of photographs.

23. A printing device, in particular an inkjet printer, with an integrated film coating device that generates heat and optionally also pressure.

24. A printing device according to Claim 23, characterized in that the film coating device consists of heatable rollers.